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Acceptance and Use of Mobile Payments

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Abstract

This study applies the Technology Acceptance Model to examine factors such as perceived usefulness and perceived ease of use on consumer willingness to use mobile payment services. This study also includes exploratory research on external factors – convenience, security, new technology – that affect mobile payment acceptance and use. The results show that although awareness of mobile payment services is reasonably high, only a small number of New Zealand consumers actually use m-payments. However, consumers acknowledge that mobile payment services can be useful, easy to use and convenient.

Keywords

mobile payments, mobile business, technology acceptance model, m-payments, m-business

Introduction

The ubiquitous mobile telephone has evolved from a simple communications tool to a multi-functional computing device. In addition to voice calls, modern mobile telephones also include text capability, cameras, contacts lists, calendars, e-mail access, Web browsing and much more. This increased functionality has made the mobile phone as common and intimate as, well, a wallet, purse, keys or money (Srivastava 2005). Increasingly, individuals are adding payments for goods and services to the list of functions they expect from their mobile telephone.

Mobile payments are the newest form of electronic payments which, in the business-to-consumer mode of e-commerce, also includes EFTPOS (electronic fund transfer at point of sale), smart cards, credit card payments over the Internet, e-cash, and others. E-payment has been a popular payment method for consumers because it makes the need for cash on hand less crucial. Businesses benefit as well because funds can be transferred without having to handle or transport cash and coins. For both consumers and businesses, transactions can be more easily tracked and monitored.

The value proposition for mobile payments is derived from both the ubiquitous nature of the mobile phone and the potential for micropayments. In the latter case, mobile telephone operators already have billing systems that track micropayments (e.g., a 20 cent text message) so mobile phones are especially well placed when billing small amounts (e.g., a parking meter, a vending machine) at low transaction costs (Hinds 2004). Global mobile payment transactions are estimated to grow rapidly to be worth £20 billion by 2008 (New Media Age 2004).

However, are consumers ready to embrace this new method of payment? What barriers / incentives might reduce / increase uptake of mobile payments in the consumer market? This study addresses these questions in a small country context.

Purpose of the Study

The purpose of this study is to assess consumer acceptance and use of their mobile phone for retail point-of-sale payments. The study begins by examining to what extent are New Zealand consumers aware of and already using mobile payments? The second research question applies the Technology Acceptance Model (TAM) to ask how do New Zealand consumers perceive the use of their mobile phone for payments and exploratory research on external factors why consumers do and don't use mobile payments?

This study examines cellular m-payment – the use of a mobile telephone and associated services, especially text messaging, to make a consumer purchase (Dewan & Chen 2005). Other forms of mobile payment exist, either

using other devices (e.g., proximity contact cards, RFID tag, laptop computer on wireless network) or for other purposes (e.g., person-to-person mobile banking, bill payment by mobile phone), but these are not considered in the current study.

Mobile Payment Services in New Zealand

Mobile payments are not science fiction. Several m-payment services already exist in New Zealand and these are briefly described in this section.

TXT-a-Park allows a consumer to use their mobile phone to pay for permission to park a vehicle in an on-street location for an allotted period of time (i.e., a parking meter payment). Briefly, a parking meter code and desired payment is texted to the parking authority and a parking receipt is printed for placement on the vehicle's dashboard. The payment and a 50-cent service fee are deducted from the prepaid balance or charged to the user's mobile phone account. Txt-a-Park is available in both Wellington and Auckland on both the Vodafone NZ and Telecom NZ networks.

HotLink™ is used to pay a Vodafone mobile phone bill or top up a prepay account from a bank account. Once registered, the consumer follows a series of menu choices and enters a PIN number to transfer money (minimum NZ$20) from a bank account to their Vodafone account. Two-factor authentication is used at registration and all HotLink transactions are encrypted. There is no service fee for this service.

mTicket sells ticket to certain events over the Vodafone network. After initiating the purchase via a text message (e.g., "text this event number to 858") and confirming it with a "buy" text message, a reply text message contains a booking number that is shown at the venue to gain entry. The cost of the ticket and a NZ$2-2.50 per ticket service fee is charged to the user's Vodafone account or prepay balance. (Note: most ticket sellers in NZ charge a similar service fee.)

Telecom Music Store / Vodafone Live! Music – both NZ mobile phone operators sell ring tones (NZ$2-7.00) and full song tracks (usually NZ$3.50) to their customers with appropriate handsets (e.g., sufficient storage space for the song).

Previous Research

This section introduces the theoretical framework used in the study – the Technology Acceptance Model – and a summary of previous research.

Technology Acceptance Model

The Technology Acceptance Model (TAM) is a theoretical model that explains how users come to accept and use a technology (Davis 1993). TAM assumes that perceived usefulness ("the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis 1989, p. 320)) and perceived ease of use ("the degree to which a person believes that using a particular system would be free of effort" (Davis 1989, p. 320)), with the influence of pre-existing external variables (e.g., security concerns, convenience), are the primary determinants for adoption of a new technology (Lu et al. 2003). Perceived ease of use has a direct effect on perceived usefulness and both determine the consumer's attitude toward use, which leads to behavioural intention to use the system and actual use of the system.

Consumer Acceptance of Mobile Payments

Mobile payments is emerging as a popular research topic. Previous studies in the area of consumer acceptance and adoption have focused on security (Antovski & Gusev 2003; Dewan & Chen 2005; Kreyer, Pousttchi & Turowski 2003; Lee, Kou & Hu 2005; Pousttchi & Zenker 2003), convenience (Dewan & Chen 2005; Kreyer, Pousttchi & Turowski 2003; Pousttchi & Zenker 2003; Teo, Fraunholz & Unnithan 2005), cost (Antovski & Gusev 2003; Kreyer, Pousttchi & Turowski 2003; Zmijewska 2005; van der Kar & van der Duin 2004; Pousttchi & Zenker 2003) and perceived ease of use and usefulness (Antovski & Gusev 2003; Dewan & Chen 2005; Teo, Fraunholz & Unnithan 2005; Zmijewska 2005). The findings of most of these studies can be summarised by saying that in order for mobile payments to succeed, they much be secure (both in reality and consumer perception), convenient, easy to use and be offered at little or no additional cost to the consumer. For example, the mobile payment survey (MP1) found 96% of respondents required confidentiality of data and 92% required little or no costs (Pousttchi & Zenker 2003).

Research Method

An electronic, self-administered questionnaire was used in this study. The survey method is appropriate for this study as it provides a quantitative description of attitudes, experiences and opinions of the sample population (Creswell 2003). It is an efficient way of gathering data using a standard set of questions.

The target population was all mobile phone users in New Zealand. The Web-based survey was available during October and November 2006 and was widely advertised in the local student and academic community and at the popular Web site Textvouchers.com, which includes subscribers from throughout New Zealand.

Results

In the end, 132 usable responses were received and the demographic profile of the respondents is summarised as follows:

> Almost half (46%) of respondents were 21-30 years of age. Twenty-six percent were under 21 years of age and the rest (28%) were 31 or older.
>
> Forty-one percent of the respondents earned less than NZ$10,000 per year and another 29 percent earned NZ$10-25,000. Only 10% earned more than NZ$45,000.
>
> About 70% of respondents own only one mobile phone. Nearly 26% own two mobile phones, and 4% own three or more mobile phones.
>
> Over 50% of participants have owned a mobile phone(s) for more than five years. Only 6% had been using a mobile for less than a year. Those who have had a mobile phone from 1 – 2 years are 16% and those who have owned at least one from 3 – 5 years are 28%.
>
> Nearly 50% of respondents sent 21 or more text messages per week. An approximate same percentage (15-16%) sent 2 – 5, 6 – 20 or 11 – 20 text messages per week. Very few (4%) send one or zero messages per week.

Comparable data to the New Zealand population are not available, but there is nothing to suggest that this sample is not representative of the New Zealand population who owns a mobile phone. The most likely exception is the relatively low income level of the respondents (average New Zealand income is approximately NZ$37,000 per year).

Consumer Use of Mobile Payment Services

Table 1 shows how many respondents knew of the existence of current mobile payment services in New Zealand (column 2; table ranking) and the number of times they had used it (columns 3-6). The 55+ percent response for music purchases and Hotlink is not surprising given the widespread promotion of both services by both mobile operators. The Txt-a-Park figure is also relatively high, given that Txt-a-Park is only available in two city centres. Twelve percent of respondents have not heard of any m-payment services.

The "use" percentages in Table 1 include only those respondents who had knowledge of the payment service, so this analysis is know-of-and-used. Hotlink is the most widely used service (29% used it at least once), followed by phone-accessible music stores (25%), TXT-a-Park (21%) and mTicket (17%).

Table 1: Knowledge and use of mobile payment services

	Know of…	Not used	Used: 1-2	Used: 3-4	Used: 5+
Music	59.8%	74.7%	8.9%	6.3%	10.1%
HotLink	55.3%	70.8%	9.7%	4.2%	15.3%
TXT-a-Park	51.5%	79.4%	10.3%	2.9%	7.4%
mTicket	13.6%	83.3%	11.1%	5.6%	0.0%
None at all	12.1%	--	--	--	--

Consumer Attitudes Toward Using Mobile Payments

The key objective of this research was exploration of variables related to the Technology Acceptance Model that determine attitudes toward use – perceived usefulness, perceived ease of use, previously identified external factors such as security concerns and convenience, and exploratory research on other potential factors. In some

cases, the results of this New Zealand-based study (NZ) are presented and discussed with results from a comparative study (Dewan & Chen 2005) in the United States (US).

Most NZ respondents (59%) perceive mobile payments to be useful or very useful, similar to US consumers (61%), as shown in Table 2. A small proportion of New Zealanders (8% versus 14% in US) consider mobile payments "not useful".

A similar pattern is evident in the perceived ease of use – a large majority in both countries (56% in NZ and 78% in US) considers mobile payments easy or very easy to use and only a small percentage (approximately 7%) in both countries rate mobile payments as low in perceived ease of use.

Will mobile payments improve convenience in paying for goods and services? While a majority of Americans think so (54%), slightly fewer New Zealanders (47%) recognise convenience as an important factor.

Table 2: Comparison of perception of mobile payments

Perceived usefulness	Not useful at all	Not useful	Neutral	Useful	Very useful
New Zealand	1.7%	6.8%	32.2%	35.6%	23.7%
United States	2.0%	12.3%	24.3%	51.2%	10.3%
Perceived ease of use	Not easy to use at all	Not easy to use	Neutral	Easy to use	Very easy to use
New Zealand	0.8%	6.7%	36.1%	41.2%	15.1%
United States	2.0%	4.7%	15.2%	62.5%	15.5%
Convenience	Will not improve at all	Will not improve	Neutral	Will improve	Will definitely improve
New Zealand	1.7%	6.7%	44.5%	35.3%	11.8%
United States	1.8%	14.4%	29.9%	45.2%	8.7%

Perhaps the most significant factor that determines attitude toward use is security (e.g., Lee, Kou & Hu 2005; Pousttchi and Zenker 2003) and so security was explored in considerable depth in both studies. Specifically, four aspects of security – authentication, confidentiality, non-repudiation, and data integrity – were examined and results for both New Zealand (this study) and the United States (Dewan & Chen 2005) are presented in Table 3.

Table 3: Comparison of perception of mobile payment security

Authentication	Very concerned	Concerned	Neutral	Not concerned	Not concerned at all
New Zealand	39.3%	34.2%	22.2%	2.6%	1.7%
United States	6.7%	29.0%	34.1%	24.1%	6.1%
Confidentiality	Very concerned	Concerned	Neutral	Not concerned	Not concerned at all
New Zealand	50.9%	28.4%	15.5%	3.5%	1.7%
United States	6.1%	21.2%	31.9%	34.0%	6.7%
Non-repudiation	Very concerned	Concerned	Neutral	Not concerned	Not concerned at all
New Zealand	25.9%	34.5%	31.0%	8.6%	0.0%
United States	3.1%	11.6%	33.6%	42.8%	8.9%
Data integrity	Very concerned	Concerned	Neutral	Not concerned	Not concerned at all
New Zealand	42.7%	29.1%	22.2%	5.1%	0.9%
United States	2.1%	7.0%	24.1%	56.7%	10.1%

The key observation from Table 3 is that on all four aspects, security of mobile payments is of considerably greater concern to New Zealanders than Americans. This difference is somewhat difficult to explain as New Zealanders have a reputation for being quite accepting and trusting of new technologies. Timing of the two studies may be an issue as the US study was completed in 2004 or earlier, before considerable media coverage

about mobile security issues in 2006, the year in which the New Zealand population was surveyed. Whatever the explanation, mobile service operators, especially in New Zealand, will have to provide secure mechanisms for mobile payments and publicise them broadly to their customers.

Consumer Acceptance of Mobile Payments

For the first time we are aware of, this study conducted exploratory research on the underlying reasons why consumers do or don't use mobile payments. For example, previous studies (e.g., Antovski & Gusev 2003; Dewan & Chen 2005; Pousttchi & Zenker 2003) have explored convenience as a contributing factor in the use of mobile payments (i.e., as one of several factors) and at a high level (e.g., rate on a five-point Likert scale). However, no previous research has examined underlying reasons for use / non-use within the convenience factor (e.g., easier than cash to use, no coins available, easy to learn) as this study does. Similarly some studies have suggested security is a reason for non-use (e.g., Antovski & Gusev 2003; Lee, Kou & Hu 2005; Nambiar, Lu and Liang 2004), but not empirically measured customer non-use due to security concerns. Other reasons for use and non-use (e.g., quality of result, resistance to use of text messaging) have never been examined in previous research, based on our review of the literature. In this study, survey respondents were asked to indicate any reason for use or non-use of mobile payments and the ranked results are shown in Tables 4 and 5.

Table 4: Reasons for using mobile payments

No coins available	59.6%
Convenience of buying goods and services	37.5%
Easier than cash	36.0%
Trying new technologies	31.6%
Novelty of using m-payments	28.7%
Easy to learn and simple to use	24.3%
Better quality obtained	17.6%

Not unexpectedly, convenience is a key reason why many consumers would chose to use mobile payments – convenience is included in some aspects of the top three reasons that consumers will use mobile payments. By far, the largest proportion (60%) use mobile phones for the most convenient reason of all – they have no other option. Another reason, supported by anecdotal evidence, is that NZ consumers like to "give it a go" and try any new payment option at least once. However, mobile service operators need to realise that if the service does not live up to expectations, it is unlikely that the consumer will repeat the process, something that is essential to maintaining and growing average revenue per user (ARPU).

Table 5: Reasons for not using mobile payments

Dislike paying for service fees	61.0%
Proper security is probably lacking	30.2%
Easier to pay with cash	30.2%
Service is easy to use, but registration is too troublesome	29.4%
Try new technology later	14.7%
Don’t want to change how things are usually done	11.0%
Do not like sending text messages	5.2%
Do not know how to send text messages	2.9%
Can’t be bothered trying new things	2.2%

Table 5 explores the reasons why people would not use mobile payments. A large majority (61%) of respondents are opposed to paying service fees. One explanation for this may be the relatively large percentage of low-income respondents in the study. In a study that included a more income-representative population, resistance to paying service fees may decrease. Approximately equal percentages (30%) cite security, the convenience of using cash, and burdensome registration processes as problems.

Conclusion

Mobile payment services are not widely known and used even less in New Zealand. These findings provide empirical evidence to support observations made about lack of consumer uptake in Australia (Teo, Fraunholz & Unnithan 2005) and Europe (Karnouskos & Vilmos 2004). Nevertheless, New Zealanders consider mobile payments to be useful, easy to use and convenient. However, NZ consumers are concerned about security, especially confidentiality, and that mirrors the results of many studies including Dewan and Chen (2005) and Pousttchi and Zenker (2003). No other study has considered a variety of underlying factors that explain why consumers use or don't use mobile payments (Tables 4 and 5). Further research to refine and better qualify these factors is needed.

The findings of this study will be especially useful for mobile telephone operators interested in increasing ARPU through mobile payments and merchants who wish to provide mobile payment systems to their customers.

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